Evolving Roles of Teachers from Education 1.0 to Education 5.0: Balancing Technology and Human-Centered Pedagogy

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Abstract

This study investigated the evolving role of teachers across five educational paradigms, from Education 1.0 to Education 5.0, and showed how pedagogical, technological, and societal changes progressively redefined their role and responsibility. In Education 1.0, teachers served as authoritative transmitters of knowledge in rigid, teacher-centered settings. Education 2.0 shifted toward learner-centered and collaborative approaches, positioning teachers as facilitators, though traditional practices often remained intact. Education 3.0 further transformed teaching through digital and networked learning, expanding teachers' roles as mediators of digital resources despite ongoing issues of digital inequity. Education 4.0, prepare teachers to become technology-enhanced, competency-based learning, raising concerns about data privacy and algorithmic bias. Education 5.0 advanced towards human-centered model integrating technology with sustainability, ethics, and well-being, envisioning teachers as ethical leaders and mentors supporting holistic development. The study concluded that, although each paradigm presented unique opportunities and challenges, the teacher's role continually grew in the fast-changing world of modern times.

Key Words: Teachers, Education 1.0–5.0, Pedagogical Changes, Technology, Human-centered

Introduction

Over time, the role of teachers has transformed dramatically as teaching methods evolve, technology advances, and the skills needed in the modern world continue to shift. In Education 1.0, teaching followed a traditional, teacher-centered model where educators acted mainly as authoritative sources of knowledge. This approach focused on delivering content, maintaining discipline, and following standardized instruction, which provided structure but limited student engagement, critical thinking, and customization. This

traditional framework gave way to Education 2.0, influenced by constructivist ideas and collaborative learning methods, where teachers became facilitators rather than just transmitters of knowledge. In this learner-focused setting, educators promoted interaction, inquiry, and teamwork. Yet, challenges such as inconsistent application and continued use of conventional assessments remained.

With the rise of digital technology, Education 3.0 transformed the teacher's role into that of a mediator and guide in networked, self-directed learning environment. Teachers curated online resources, supported digital collaboration, and encouraged learner independence. However, unequal access to technology, varying digital skills among teachers, and concerns about the depersonalization of learning slowed progress. Education 4.0, aligned with the Fourth Industrial Revolution, brought new demands for teachers to create flexible, tech-enhanced learning experiences incorporating artificial intelligence, data analytics, and competency-based methods. This shift expected teachers to balance innovation with ethical concerns such as data privacy, fairness, and avoid over-dependence on technology.

Emerging as a response to the limits of both human-centered and tech-driven models, Education 5.0 presents a holistic vision that combines advanced technologies with core human values, sustainability, and social well-being. In this framework, teachers are ethical leaders, mentors in emotional and intellectual growth, and partners in building innovative learning communities. Their responsibilities go beyond instruction to encompassing empathy, global citizenship, environmental awareness, and lifelong learning skills. As education systems globally face complex challenges like digital divides and emotional support needs, it becomes crucial to understand how teachers' roles have transformed across these paradigms. This progression underscores the importance of redefining teaching to blend technological opportunity with humanistic principles essential for fair and future-ready education.

Objectives of the research

1. To explore the evolution of teachers' role across educational paradigms from Education 1.0 to Education 5.0, emphasizing significant changes in teaching methods, technology use, and the nature of learner support.
2. To investigate new responsibilities and skills required to cope with Education 5.0, focusing on how teachers can effectively integrate technological advancement while upholding human-centered principles like ethics, well-being, sustainability, and equity.

Teachers' role within the framework of Education 1.0

The role of teachers in education has been extensively studied in the era of 1.0, with research consistently highlighting their central position in shaping student learning and achievement. Teachers are regarded as instructional designers whereby they clearly define learning goals and make arrangements for sequencing content and ensuring that students comprehend the criteria for success—a practice commonly known as "teacher clarity"—which has been strongly associated with enhanced academic achievement. (Hattie, 2009). Effective teaching also relies on evidence-based instructional practices, such as reviewing prior knowledge,

breaking learning into manageable steps, guided practice, and frequent checks for understanding, as emphasized in Rosenshine's *Principles of Instruction* (2012). Teachers further serve as formative assessors, as they gather ongoing evidence of student understanding and adapt lessons accordingly, which has shown to raise achievement (Black & Wiliam, 1998). Beyond instruction, creating a positive classroom climate and effective management is essential, along with well-organized routines and supportive environments that promote student engagement and minimize behavioural problems. (Marzano & Marzano, 2003). Equally significant are teacher–student relationships, with studies showing that warm yet structured interactions improve academic, behavioural, and social outcomes. Shulman (1986) also underlined the importance of teachers' pedagogical content knowledge (PCK), highlighting how effective educators transform subject matter to suit learners' needs. At a broader level, collective teacher efficacy which includes a shared belief among teachers in their collective ability to impact student learning emerges as one of the most powerful factors influencing achievement (Hattie, 2015). In addition, teachers act as equity advocates, mitigating the effects of socio-economic background through targeted support and culturally responsive pedagogy, a role reinforced by UNESCO and OECD reports emphasizing teachers as drivers of quality and inclusion in education. Finally, the role of teachers extends beyond instruction into continuous professional learning and system-level contributions, where effective training, collaboration, and mentoring directly strengthen educational outcomes. Thus, across evidence from multiple studies, teachers are not merely transmitters of knowledge but dynamic professionals who design, facilitate, and adapt learning while also shaping equitable and supportive educational systems.

Teachers' role in Education 2.0

Education 1.0, often described as the *traditional model* of schooling, positioned teachers as the central authority and primary source of knowledge. While effective in ensuring structured content delivery and discipline, this model faced several **drawbacks**. Research suggests that Education 1.0 emphasized rote memorization over critical thinking, limited student agency, and reinforced passive learning where students were mere recipients rather than co-constructors of knowledge (Hattie, 2009; Marzano & Marzano, 2003). The rigid, lecture-based structure often failed to accommodate diverse learning needs, discouraged creativity and restricted collaborative opportunities whereby leaving the learners underprepared for dynamic and knowledge-driven societies (Freire, 1970; Dewey, 1938).

The **emergence of Education 2.0** was driven by the limitations of this traditional model as well as broader socio-technological transformations. Influenced by constructivist theories of learning (Vygotsky, 1978; Jonassen, 1999) and the early integration of ICT, Education 2.0 reframed the classroom from a teacher-centered environment to a learner-centered focusing on a collaborative ecosystem. The availability of digital tools, social media that networked learning platforms further supported this shift, enabling interactive, participatory, and knowledge-sharing forms of education (Redecker et al., 2011).

In this context, the **role of the teacher in Education 2.0** evolved significantly. Teachers were no longer seen merely as transmitters of information but as facilitators, mentors, and co-learners who guided students in

inquiry-based and project-based tasks. They design interactive learning experiences, scaffolded understanding, and fostered critical thinking, creativity, and problem-solving skills (Jonassen, 1999; Brindley, Walti, & Blaschke, 2009). Moreover, teachers in Education 2.0 integrated digital tools to enhance engagement, promoted collaboration, and encouraged learners to take greater ownership of their educational journey (Redecker et al., 2011). Unlike the rigid hierarchy of Education 1.0, the teacher–student relationship in 2.0 was built on partnership, dialogue, and shared responsibility for learning outcomes.

Overall, the **transition from Education 1.0 to Education 2.0** reflected a paradigm shift from authority and discipline toward interaction, participation, and personalization. While the drawbacks of Education 1.0 highlighted the limitations of one-way knowledge transmission, Education 2.0 redefined the teacher's role as a dynamic facilitator who nurtured collaboration, autonomy, and adaptability and promoted qualities which were essential for learning in a digital and interconnected world.

Role of teachers in Education 3.0

Education 1.0, often described as the traditional teacher-centered paradigm, positioned teachers as authoritative transmitters of knowledge whose primary role was to deliver content, maintain discipline, and assess learning outcomes. While this approach provided clarity and order, research has shown that it frequently led to rote memorization, limited critical thinking, and passive student participation, leaving little scope for creativity, learner agency, or collaboration (Hattie, 2009; Marzano & Marzano, 2003). Education 2.0, influenced by constructivist pedagogy and the early integration of digital technologies, sought to overcome these drawbacks by promoting learner-centered and interactive approaches. Teachers in this model became facilitators of inquiry, collaboration, and project-based learning (Jonassen, 1999; Brindley, Walti, & Blaschke, 2009). However, despite these advances, Education 2.0 also faced some significant limitations. Studies highlight issues such as shallow use of digital tools (often limited to substitution rather than transformation), persistent digital divides in access and skills, uneven quality of online collaboration, and gaps in teachers' capacity to design purposeful digital pedagogy (Redecker et al., 2011; UNESCO, 2018; European Commission, 2017). These challenges limited the transformative potential of Education 2.0 and underscored the need for a more adaptive and future-oriented model.

The emergence of Education 3.0 responded directly to these shortcomings while addressing global educational priorities in an interconnected, knowledge-driven world. Drawing on connectivist and heutagogical perspectives, Education 3.0 emphasizes learner agency, self-determined learning, and knowledge co-creation across digital and social networks (Siemens, 2005; Gerstein, 2014). Policy frameworks such as the OECD Learning Compass 2030 further highlighted the need for transformative competencies creativity, responsibility, resilience and co-agency between learners and teachers to prepare students for complex, uncertain futures (OECD, 2019). Within this framework, the role of the teacher expanded beyond that of facilitator to that of a learning ecosystem designer, network broker, and mentor. Teachers curated open educational resources, orchestrate authentic projects, and connect learners with diverse communities and knowledge networks (Gerstein, 2014; Siemens, 2005). They also guided students in goal setting,

metacognition, and co-assessment, gradually transferring responsibility to nurture independent and lifelong learning (Jonassen, 1999). Furthermore, teachers in Education 3.0 used data and digital tools not merely for efficiency but to personalize learning ethically, monitor progress through competency-based frameworks, and ensure equity by addressing digital divides (UNESCO, 2018; European Commission, 2017).

Thus, the transition from Education 1.0 to 2.0 and now to 3.0 reflects a paradigmatic shift in the teacher's role. While Education 1.0 emphasized authority and content delivery and Education 2.0 emphasized facilitation and collaboration, Education 3.0 positioned teachers as designers, mentors, and equity advocates in a networked learning society. Their role is no longer confined to classrooms but extends to digital and social ecosystems where knowledge is constructed collectively. In this sense, the need for Education 3.0 emerges not only from the drawbacks of earlier models but also from the demands of a rapidly changing global landscape which requires education to cultivate agency, adaptability, and inclusive participation for all learners.

Role of teachers in education 4.0

Education 2.0, shaped by constructivist pedagogy and the rise of Web 2.0 technologies, emphasized collaboration, student-centered learning, and the teacher's role as a facilitator (Jonassen, 1999). While this shift encouraged active engagement and peer learning, it also revealed several drawbacks. Many classrooms faced challenges in effectively integrating digital tools, often resulting in superficial rather than transformative use of technology (Redecker et al., 2011). Additionally, persistent digital divides limited equitable access, and varying levels of teacher preparedness further weakened the model's impact (UNESCO, 2018). Building on this, Education 3.0 extended the constructivist model towards heutagogy and connectivism, stressing learner autonomy, knowledge co-creation, and networked communities (Siemens, 2005; Gerstein, 2014). However, Education 3.0 also presented drawbacks: not all learners possessed the self-regulation skills required for autonomous learning, inequities in technological access deepened, and concerns about data privacy, assessment alignment, and the ethical use of digital platforms remained unresolved (European Commission, 2017; OECD, 2019). These limitations in both Education 2.0 and 3.0 underscore the necessity for a more adaptive and future-oriented educational framework.

The **emergence of Education 4.0** responds to these gaps while aligning education with the demands of the Fourth Industrial Revolution, characterized by artificial intelligence, automation, and global interconnectedness (Schwab, 2017; World Economic Forum, 2020). Education 4.0 emphasizes not only digital literacy but also the development of critical thinking, adaptability, creativity, collaboration, and socio-emotional intelligence as essential competencies for 21st-century learners (OECD, 2019). Within this paradigm, the **role of the teacher** underwent a significant transformation. Teachers are expected to function as *learning experience designers*, integrating emerging technologies such as AI, virtual/augmented reality, and adaptive learning platforms to provide personalized, competency-based instruction (Popenici & Kerr, 2017). They also act as *mentors and coaches*, fostering ethical reasoning, global citizenship, and lifelong learning mindsets while balancing human values with technological fluency (Salmon, 2019). Furthermore,

teachers serve as *data-informed practitioners*, leveraging learning analytics to identify learner needs and adjust pedagogy, while ensuring equity and safeguarding privacy (UNESCO, 2019). Importantly, they are *continuous learners* themselves, upgrading digital, pedagogical, and socio-emotional competencies to adapt to rapidly evolving global contexts (OECD, 2019).

Thus, Education 4.0 emerges as a crucial evolution, addressing the shortcomings of Education 2.0 and 3.0 by positioning teachers not merely as facilitators or co-learners but as adaptive professionals who merge human-centered pedagogy with advanced technologies. In doing so, they ensure education remains equitable, inclusive, and future-ready in the era of the Fourth Industrial Revolution.

Role of teacher in education 5.0

Education 3.0, rooted in heutagogy and connectivism, encouraged learner autonomy, knowledge co-creation, and networked learning environments (Siemens, 2005; Gerstein, 2014). However, significant drawbacks emerged, including disparities in learners' self-regulation skills, inequitable digital access, and difficulties in aligning autonomous learning with assessment and accreditation systems (European Commission, 2017; OECD, 2019). Similarly, Education 4.0, aligned with the Fourth Industrial Revolution, emphasized personalization through artificial intelligence, adaptive platforms, and immersive technologies (Schwab, 2017; World Economic Forum, 2020).Although this framework resolved certain shortcomings of Education 3.0, it simultaneously gave way to new challenges. Heavy reliance on technology risked widening the digital divide, ethical dilemmas emerged regarding data privacy and algorithmic bias, and an overemphasis on employability skills sometimes overshadowed humanistic and socio-emotional dimensions of education (Popenici & Kerr, 2017; UNESCO, 2019). Teachers in Education 4.0 faced increased demands to master complex digital ecosystems, balance personalization with equity, and act as both data interpreters and ethical gatekeepers (Salmon, 2019). These unresolved issues highlight the need for a more human-centered and sustainable paradigm.

The **emergence of Education 5.0** reflects this necessity, shifting from a purely technology-driven model towards a values-based, human-centric approach to education (Ahmad et al., 2022). Education 5.0 emphasizes not only digital and cognitive competencies but also sustainability, ethics, well-being, empathy, and social justice as integral parts of learning (García-Peñalvo, 2021). It aligns with the vision of Society 5.0, which integrates technological innovation with solutions to social and environmental challenges (Fukuyama, 2018). Within this paradigm, the **role of the teacher** is redefined once again. Teachers become *ethical leaders and human developers*, guiding students in applying knowledge responsibly to address global challenges. They act as *mentors of holistic well-being*, integrating emotional intelligence, resilience, and mindfulness into pedagogy alongside academic and technical content (UNESCO, 2021). Moreover, teachers function as *sustainability advocates*, embedding ecological awareness and social responsibility in the curriculum. They also serve as *co-creators of innovation ecosystems*, collaborating with industry, communities, and policymakers to prepare learners for both employability and responsible global citizenship (García-Peñalvo, 2021).

Thus, Education 5.0 emerges as a necessary evolution beyond the limitations of Education 3.0 and 4.0. It positions teachers not merely as digital facilitators but as humanistic guides, ethical mentors, and co-creators of sustainable futures. By balancing technological innovation with empathy, equity, and social responsibility, teachers in Education 5.0 ensure that education remains relevant, inclusive, and transformative in the face of complex global challenges.

Key challenges and opportunities of education 5.0

Education 5.0, rooted in human-centric, value-driven, and sustainability-oriented principles, presents both transformative opportunities and critical challenges in the field of higher education. On the **opportunity side**, Education 5.0 promotes a more holistic learning environment that integrates cognitive, emotional, ethical, and social dimensions of education (García-Peñalvo, 2021). By leveraging advanced technologies such as artificial intelligence, big data, and immersive platforms, universities can provide personalized, flexible, and competency-based learning experiences that prepare graduates for the complexities of Society 5.0 (Fukuyama, 2018; Ahmad et al., 2022). It also encourages higher education institutions (HEIs) to strengthen their role in sustainability and social responsibility, aligning curricula with the United Nations' Sustainable Development Goals (UNESCO, 2021). Another opportunity lies in the redefined role of teachers as facilitators of well-being, mentors of lifelong learning, and co-creators of innovation ecosystems, thus bridging academic knowledge with industry and societal needs (Salmon, 2019).

However, the implementation of Education 5.0 in higher education faces **significant challenges**. A key barrier is the *digital and socio-economic divide*, as not all students or institutions have equal access to advanced technologies required for Education 5.0 (OECD, 2019). Additionally, there are *ethical and pedagogical concerns*, including data privacy, algorithmic bias, and the risk of over-technologization that may overshadow the humanistic and socio-emotional priorities of education (Popenici & Kerr, 2017; UNESCO, 2019). Faculty readiness also poses a challenge, as many educators require substantial professional development to integrate AI-driven tools, sustainability-focused curricula, and interdisciplinary approaches effectively (Ahmad et al., 2022). Furthermore, higher education governance systems—often rigid and accreditation-focused—struggle to adapt to the flexible, learner-centered, and socially embedded models envisioned by Education 5.0 (European Commission, 2017).

In sum, Education 5.0 presents higher education with the opportunity to become a transformative force that integrates technology, sustainability, and human values, but its success depends on addressing digital inequities, rethinking governance structures, and equipping teachers with the necessary competencies. By navigating these challenges, higher education can truly evolve into a driver of both innovation and human flourishing in the 21st century.

Discussion

The role of teachers in education has undergone a significant transformation over time, evolving alongside pedagogical paradigms, technological advancements, and societal demands. In **Education 1.0**, teachers functioned primarily as **knowledge transmitters**, responsible for delivering standardized content in a teacher-centered classroom (Shulman, 1986). Their authority was rooted in subject mastery, and students were expected to absorb information passively. While this model ensured order and content coverage, it faced drawbacks such as limited critical thinking, lack of personalization, and minimal engagement (Hattie, 2009).

The emergence of **Education 2.0** marked the shift toward **learner-centered approaches**, influenced by constructivist theories and collaborative practices. Here, teachers assumed the role of **facilitators**, encouraging dialogue, group learning, and inquiry-based methods (Black & Wiliam, 1998). Despite greater focus on student participation, drawbacks included inconsistencies in implementation, difficulties in large classrooms, and persistent reliance on traditional assessments (Marzano & Marzano, 2003).

With **Education 3.0**, fuelled by digital technologies and online learning environments, teachers became **mediators and guides in knowledge networks**. They curated resources, integrated ICT, and supported students in self-directed learning (Anderson, 2010). However, challenges such as the digital divide, varying teacher digital literacy, and concerns about depersonalization limited its full effectiveness (Popenici & Kerr, 2017).

The transition to **Education 4.0**, aligned with the Fourth Industrial Revolution, expanded teachers' roles into **designers of flexible, competency-based learning experiences** that integrated AI, big data, and automation. Teachers were expected to prepare students for Industry 4.0 by fostering creativity, adaptability, and innovation (Salmon, 2019). Yet, this phase often emphasized employability over humanistic values, raising ethical concerns about over-automation, job displacement, and reduced focus on socio-emotional learning (OECD, 2019).

Finally, **Education 5.0** represents a paradigm shift that rebalances technology with humanity. Teachers are envisioned not only as **mentors and innovators** but also as **human-centered leaders who foster empathy, sustainability, and ethical responsibility** (UNESCO, 2021; García-Peñalvo, 2021). They integrate advanced technologies like AI and immersive learning, but with a strong emphasis on equity, inclusion, and student well-being. Unlike earlier phases, Education 5.0 acknowledges the shortcomings of both purely teacher-centered (1.0) and overly technology-driven (4.0) models, proposing a holistic framework where teachers act as co-creators of knowledge, facilitators of lifelong learning, and advocates of global citizenship.

The progressive role shift from **authoritative knowledge transmitters (1.0)** to **human-centered mentors (5.0)** underscores the adaptability of the teaching profession. While each paradigm brought opportunities, it also left behind challenges ranging from rigid teacher control in 1.0 to ethical and equity concerns in 4.0. The emergence of Education 5.0 highlights the need for **balanced teacher roles**, where pedagogy, technology, and human values converge to address the complex demands of the 21st century.

Findings and Conclusion

The role of teachers has transformed remarkably from Education 1.0 to 5.0, reflecting shifts in pedagogy, technology, and societal needs. In Education 1.0, teachers primarily acted as knowledge transmitters, ensuring structured learning but limiting student agency and critical thinking. Education 2.0 introduced learner-centered pedagogy, positioning teachers as facilitators, though challenges such as inconsistent practices and weak assessment methods persisted. With Education 3.0, digital technologies expanded access to learning, yet inequities from the digital divide and concerns over depersonalization hindered its inclusiveness. Education 4.0, aligned with the Fourth Industrial Revolution, required teachers to integrate AI, data, and employability skills, but it often overemphasized technology at the expense of ethics, socio-emotional learning, and equity. Education 5.0 emerges as a corrective response to these drawbacks, emphasizing the teacher's role as an empathetic leader, ethical guide, and lifelong learning facilitator who balances technological innovation with human values, sustainability, and inclusion. This progression highlights that while each phase faced limitations, teachers remain central to educational transformation, evolving from mere transmitters of knowledge to holistic mentors shaping equitable, future-ready learners.

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